

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of the claims:

1. (Currently Amended) A storage network, comprising:

a plurality of storage cells, at least one storage cell including physical storage media and a storage media controller that controls data transfer operations with the storage media;

a plurality of host computers that configurable to execute write operations to the plurality of storage cells; and to at least one storage cell;

a write control server that receives and regulates the write operations from the plurality of host computers to the plurality of storage cells, wherein the write control server positions the write operations in a queue according to a reverse handicapping process that is based on transmission delays from the plurality of host computers to the write control server.

~~at least one write control server that regulates the write operations of one or more of the plurality of host computers; and~~

~~a communication network that provides communication connections between the storage cells, the host computers, and the write control server.~~

2. (Currently Amended) The storage network of claim 1, wherein the transmission delays are calculated from round trip times of pings sent from the write control server to the plurality of host computers. ~~plurality of storage cells are geographically distributed.~~

3. (Currently Amended) The storage network of claim 1, wherein the write control server determines a transmission delay for each of the plurality of host computers and positions the write operations in the queue according to the transmission delay for each of the plurality of host computers. ~~at least one of the plurality of host computers executes write operations to store data in a primary storage unit.~~

4. (Currently Amended) The storage network of claim 1, wherein the write operations are delayed at the write control server by a time period equal to a longest transmission delay of the plurality of host computers minus a transmission delay associated with one of the plurality of host computers. ~~3,~~ wherein ~~data written to the primary storage unit is replicated to a secondary storage unit.~~

5. (Currently Amended) The storage network of claim 1, wherein the transmission delays are calculated from time stamps and indicate an amount of time for a write operation to travel from one of the plurality of hosts to the write control server. ~~implements a write permission queue to regulate write operations of the host computers.~~

6. (Currently Amended) The storage network of claim 1 ~~[[5]]~~, wherein the write control server grants write permission to only a single host computer in the write permission queue at any point in time.

7. (Currently Amended) The storage network of claim 1, wherein the write control server generates write access tokens that are transmitted to the plurality of host computers. ~~5, wherein:~~

~~the write control server grants write permission to a plurality of the host computers in the write permission queue at any point in time; and~~

~~the write control server maintains a write permission log.~~

8. (Currently Amended) The storage network of claim 1, wherein the write operations are positioned in an order in the queue based on a time period for a write operation to travel from a host to the write control server. ~~5, wherein:~~

~~host computers submit write requests to the write control server; and~~

~~the write control server implements a reverse handicapping routine when positioning the write requests in the write permission queue.~~

9. (Currently Amended) The storage network of claim 1 ~~[[8]]~~, wherein the reverse handicapping process routine delays the incoming write operations requests to compensate for an estimated travel time from a host computer to the write control server.

10. (Currently Amended) A method executing on hardware of managing data transfer operations between a host computer and at least one data storage device in a storage network, comprising:

generating, at the host computer, a write request destined for the at least one data storage device;

transmitting the write request to a write control server; and
calculating a travel time of the write request from the host computer to the write control server; and

delaying the write request at the write control server by an amount of time that is based on the travel time of the write request from the host computer to the write control server.

~~receiving, from the write control server, a signal granting permission to execute a write operation; and~~

~~in response to the signal, initiating a write operation to the at least one storage device in the storage network.~~

11. (Currently Amended) The method of claim 10, wherein the write request is delayed according to a time that the write request was generated at the host computer. ~~further comprising transmitting, to the write control server, a signal indicating a time at which the write operation is initiated.~~

12. (Currently Amended) The method of claim 10, wherein the write request is delayed according to a reverse handicapping process. ~~further comprising~~

~~transmitting, to the write control server, a signal indicating a time at which the write operation is completed.~~

13. (Currently Amended) The method of claim 10, further comprising:

determining a transmission delay for data to travel from the host computer to the write control server;

positioning the write request in a queue at the write control server in an order that compensates for the transmission delay. ~~storing in a memory location communicatively connected to the host computer:~~

~~a first signal indicating a time at which the write operation is initiated;~~

~~a second signal indicating a time at which the write operation is completed;~~

~~first information indicating contents of the write operation; and~~

~~second information indicating a status of the write operation.~~

14. (Currently Amended) The method of claim 10, wherein the write request is delayed in a queue at the write control server by an amount of time equal to a longest transmission delay of a plurality of hosts minus a transmission delay for the host computer. ~~further comprising transmitting a signal to the write control server if the write operation fails.~~

15. (Original) The method of claim 10, further comprising:

receiving, from the write control server, a failure signal including a time

stamp; and

reversing write operations performed after a time based on the time indicated on the time stamp.

16. (Original) One or more computer readable media comprising logic instructions that, when executed on a processor, cause the processor to perform the operations of claim 10.

17. (Currently Amended) A method executing on hardware of managing data transfer operations between a plurality of host computers and a plurality of data storage devices in a storage network, comprising:

receiving, at a write control server, write requests from the plurality of host computers communicatively connected to the storage network;

storing the write requests in a write permission queue at the write control server; and

positioning the write requests in the write permission queue in orders that are based on travel times from the plurality of host computers to the write control server. ~~transmitting a permission signal to at least one host computer associated with a write request in the write permission queue, wherein the permission signal grants permission to the host computer to initiate write operations.~~

18. (Currently Amended) The method of claim 17, wherein the write requests are positioned in the write permission queue according to a time that the write

requests were generated at the plurality of host computers. ~~further comprising receiving, from a host computer, a status signal indicating that a write operation is complete.~~

19. (Currently Amended) The method of claim 18, further comprising transmitting a permission signal to a ~~another~~ host computer associated with a write request in the write permission queue, wherein the permission signal grants permission to the host computer to initiate write operations, if the status signal indicates that a prior write operation was completed successfully.

20. (Original) The method of claim 17, wherein:

the write requests include a time stamp; and

storing the write requests in a write permission queue comprises storing the write requests in order based on the time stamps.

21. (Currently Amended) The method of claim 17 ~~[[18]]~~, further comprising implementing a reverse handicapping routine when positioning the write requests in the write permission queue.

22. (Currently Amended) The method of claim 17 ~~[[19]]~~, wherein the write requests are positioned in the write permission queue according to a reverse handicapping routine ~~that delays the incoming write requests to compensate for~~

an estimated travel time from the plurality of [[a]] host computers to the write control server.

23. (Original) The method of claim 17, further comprising:

receiving, from a host computer, a status signal indicating that a write operation has been initiated, wherein the status signal comprises a time stamp; and

storing the status signal in a memory location communicatively connected to the write control server.

24. (Original) The method of claim 21, further comprising:

receiving, from a host computer, a status signal indicating that a write operation has failed;

retrieving, the time stamp from the status signal associated with the failed write operation; and

transmitting to at least one host computer a write failure signal comprising the retrieved time stamp.

25. (Original) The method of claim 22, wherein, in response to the write failure signal, the at least one host computer reverses write operations performed after a time based on the time indicated on the time stamp.

26. (Original) One or more computer readable media comprising logic instructions that, when executed on a processor, cause the processor to perform the data transfer operations of claim 17.

27. (Currently Amended) A method executing on hardware of managing data transfer operations between [[a]] host computers and ~~at least one~~ data storage devices in a storage network, comprising:

receiving, at a write control server, write requests from the host computers;

storing the write requests in a queue at the write control server; and
delaying transmission of the write requests in the queue to the data storage devices by an amount of time that is based on a reverse handicapping process.

~~receiving, at the host computer, a signal comprising a universal timing indicator;~~

~~initiating, at the host computer, a write operation to at least one storage device in the storage network;~~

~~associating timing information that identifies the universal timing indicator with the write operation; and~~

~~transmitting a write failure signal including the timing information to at least one network component in the storage network if the write operation fails.~~

28. (Currently Amended) The method of claim 27, wherein the reverse handicapping process is based on a longest transmission delay of the host computers minus a transmission delay associated with one of the host computers. ~~associating timing information that identifies the universal timing indicator with the write operation comprises storing the timing indicator in an entry in an undo log.~~

29. (Currently Amended) The method of claim 27, wherein transmission delays are calculated from round trip times of pings sent from the write control server to the host computers. ~~comprising transmitting the write failure signal to a plurality of host computers in the storage network.~~

30. (Currently Amended) The method of claim 27 further comprising, ordering the write requests in the queue according to a time required for the write requests to travel to the write control server minus another time required for a write request to travel to the write control server. ~~29, wherein transmitting the write failure signal to a plurality of host computers in the storage network comprises transmitting the write failure signal to a write control server.~~

31. (Currently Amended) The method of claim 27 further comprising:
determining a transmission delay for data to travel from a host computer to the write control server;

positioning a write request from the host computer in the queue at the write control server in an order that compensates for the transmission delay.
~~wherein, in response to receiving the write control signal, the plurality of host computers terminates the write operation.~~

32. (Currently Amended) The method of claim 27 further comprising:

determining transmission delays for data to travel from each of the host computers to the write control server;

delaying the write requests from the host computers according to the transmission delays. ~~28 wherein, in response to receiving the write control signal, the plurality of host computers undo write operations initiated after the time indicator in the write failure signal.~~

33. (Canceled)